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A Review on Machine Learning approaches in the education sector with Real-Time Data

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Abstract
The mounting role of Machine Learning (ML) has transformed the scope and paradigm of education amongst its different branches. Proper implementation of the machine learning techniques in the education sector facilitates the students to perform their actions in a better way. Machine learning techniques train the machine to complete the task automatically by using a learning process. Mathematical models using machine learning algorithms are used to analyze, predict and curate decisions. These decisions are taken without relying on the explicitly defining system, models, and parameters. These days' smart services like E-learning, Internet of things (IoT), and cloud-based models are used frequently in the education sector. There are many factors affecting education. In this review, various educational frameworks have been discussed to see the role of machine learning in it. These frameworks demonstrate that during the learning process parameters like students' mental health, and teaching effectiveness makes difference to the students. Parameters affecting student mental health have been discussed based on the existing studies. Teaching effectiveness on the other hand is a very crucial parameter that needs to be considered during the class. So, to see the effect of these parameters various educational frameworks have been analyzed. After analyzing the educational framework and the above parameters, future research problems based on framework analysis have been discussed. These research problems will give a new direction to the educational sector including the role of machine learning in it.

Keywords: Machine learning, survey, teaching effectiveness, electronic learning, mental health

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Introduction

The introduction section shows different technologies that help students to improve learning. In the education sector IoT, machine learning and blockchain, etc. are a few technologies that are used frequently nowadays. The use of these technologies has changed the role of learning for students in education. Machine learning help in learning from the prediction in attendance, early dropout prediction to predict early performance, etc. Following are the few technologies which show their role in the education sector. The introduction section covers the role of IoT and machine learning including the effects of COVID 19. Education is a joyful journey filled with new experiences. It entails examining a student's attitude toward education. The Internet of Things (IoT) plays a critical role in today's smart environments in education. We need a "smart" environment rather than a traditional one. On university campuses, IoT

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services such as smart lighting, tracking, and parking are implemented by employing environment, safety sensors to detect motion, smoke, fire, or water, automated door, lighting opening, and closing, and monitoring university equipment [1]. Data collected from IoT devices combined with a learning management system (LMS) to see the learners' progress and evaluation. This can provide real-time data analytics and reports. As schools and universities use more connected devices, the education sector is also being impacted. Moreover, tracking of equipment, automatic attendance, monitoring lighting security system, etc. is done with the help of IoT in the universities [2]. Now, a day's role of machine learning in e-Learning increased. During the education process, every student has to meet their demands. In a personalized learning environment, adaptive e-Learning is used. Every student is having different personality traits. Knowledge of personality traits improves the learning. More appropriate learning interventions are provided by the instructor after understanding the personality traits. It increases the accuracy of personalization based on personality traits [3].
Artificial Intelligence and Machine Learning have a great impact on e-Learning. Methods of machine learning improved Technology Enhanced Learning Environments (TELE). Modernization in the education system and e-Learning become more and also popular. The machine learning method helped in the analysis of the learner's data which improved the learning experience. The main goal is to assist course designers in the educational re-engineering process using machine learning and a variety of factors, including previous learner interactions [4].
Machine Learning is used to enhance e-Learning and analyze a huge amount of data generated by TELE. Data is playing an important role for the individuals who are studying from home. E-Learning becomes easy for every- one with the help of the internet as it is used for an interactive session of information. Cloud-based e-learning model can help to overcome the problem faced by e-Learning.
Somehow e-Learning is facing the problem of safety which can be overcome with the cloud-based e-learning model. A new generation model is generated for cloud-based e-learning systems. Cloud-based e-Learning Scalability, availability, and feasibility are higher in the case of cloud-based e-Learning. Creation of a new generation of e-learning systems supported by a cloud-based environment, it can run on a broad range of hardware devices.
Data is captured in the cloud in this system. Cloud-based services, such as those provided by Google, Amazon, and Windows, might be useful in an E-learning setting. Because of its scalability, availability, and practicality, cloud-based E-learning is favored over old E-learning methods. Cloud-based learning was created to fulfill the demands of today's E-learning students, allowing them to make use of all of the accessible resources. Because information is kept on a hard drive, traditional E-learning models may lose information in the event of a system failure. Whereas, the cloud-based E-learning paradigm allows students to learn on their chosen devices. Additionally, the cloud acts as a data backup, allowing students and instructors to preserve technological control [5].

Table 1 Old E-learning vs cloud-based learning models' evaluation.

Terms	**Traditional E-learning model**	**Cloud-based Model**
Safety of content	The safety is compromised	For Cloud system securing efforts are directed and suppliers have done it efficiently.

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Information sharing	The devices that learners can use to access information are limited.	The device uses handheld gadgets can be included.
Upgrade	To upgrade both hardware needs to be changed.	Sharing of the content is made easy by creating an environment rather than a device.

In table 1 comparison of traditional machine learning models has been done with cloud-based models on the parameters of the safety of content, information sharing, and upgrade.
Following students' performance using e-Learning is really important for the teachers. In a learning management system, all the learning objectives and student interactions are watched to see student performance. The teacher evaluation process has supported by a software architecture called Student Academic Performance Evaluation System (SapeS) is based on Learning Analytics and Learning Objectives. Real-time data is used, to scrutinize and visualize seeing the student's performance and results are exposed on the dashboard [6].
The three main pillars of education these days are the teacher, student, and e-Learning services. Various activities and knowledge is given by the teachers and students perceive it and complete the learning process with the assistance of e-Learning services. Algorithms are also designed to calculate user information and the behavior of the students. Recommendation algorithm using e-Learning services proposed which solve the problem faced in e-Learning. Problems related to accuracy, recall, and effectiveness is considered and solved using recommended system [7]. Even COVID 19 affected the educational sector too and while discussing approaches and facts of the education sector the period of COVID 19 cannot be ignored. COVID 19 put many challenges for the education sector. During COVID 19 face to face teaching and meetings were canceled to reduce the risk of exposure. Online lectures, videos, and virtual visiting created COVID-19 an information hub. Modern communications tools were used. Conferences have been done through online mode and virtual meetings do face some limitations but more than that it is a very good alternative to the face to face education [8]. An online lecture during a particular course is considered the first iteration of the online course. After analysis author concludes that to make the students more active the video lectures should be uploaded regularly and they should be of small length [9].

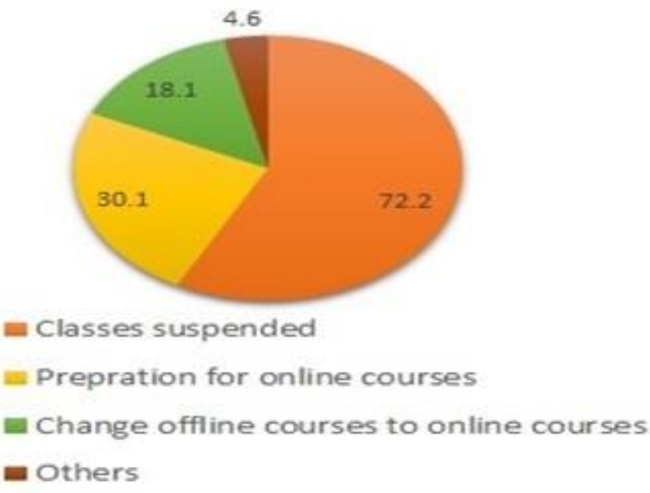

Fig. 1 Business situation of Chinese educational institutions during the 2020 epidemic [10].

Figure 1 shows the effects of Covid-19. It's also worth mentioning the issue with online courses for students who don't have access to computers or the Internet [10]. During COVID 19, descriptive qualitative research using the survey method was directed to determine the effectiveness of WhatsApp in digital system subjects. Whatsapp is being used to pique the students' interest. However, this study has a negative outcome because students prefer face-to-face education to online education. When the learning process involves WhatsApp, students believe it is difficult [11]. Figure 1 shows that 72.2 percent of classes were suspended, 30.1 percent of institutions prepared for online classes, and 18.1 percentage of institutions change offline courses to online courses. 4.6 percentage for others. So, it is clear from figure 1 that COVID 19 affected the education sector adversely and institutions shifted to online classes from offline classes.

1.1 Contribution and Recommendation of the Proposed Study

In this study, a systematic survey has been done on the various parameter related to the education sector. Various technologies are incorporated into the education sector from time to time. Among all these technologies Machine learning is playing a prominent role in education now a day. Machine learning approaches are used to measure the students' academic emotions and learning outcomes etc. Academic intelligence leads to the student's motivation and success. Along with academic emotions, students face various psychological and personal factors affecting their success. So, one very important factor i.e. student's mental health is considered and elaborated in detail. During a class, various parameters like quality of content, teacher's behavior, quality of delivery, teaching effectiveness, the experience of the teacher, examples, applications, etc. are considered. Students are highly affected by the teaching effectiveness of teachers. Various teaching methods adopted by the teachers in the class help students to understand and analyze the concept in depth. Learning outcomes of the students are based on different parameters including students' academic emotions, mental health, framework capabilities, teaching effectiveness, etc.

The main contribution of the presented review is listed below:

1. Role of machine learning in the education sector
2. Measuring framework capabilities along with technologies
3. Evaluating students' mental health
4. Role of teaching effectiveness in student learning outcomes

After studying several existing models, it has been seen aforementioned parameters are playing important role in students' learning and can improve learning outcomes for the students.

Table 2 Comparison of current work with existing work

Sr. No	**Emotional Self-Awareness/ Engagement/Interest**	**Stress Tolerance/Anxiety**	**Enjoyment**	**Confidence/Pride**	**Enthusiasm/Passion/Hope**	**Boredum**	**Anger/Frustation/irritation**	**Examination score**	**Teaching effectiveness**	**Students's Mental health**	**Framework Capability**	**Citation**
1	✓	✓	×	×	×	×	×	×	✓	✓	×	12

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2	✗	✓	✓	✗	✗	✓	✗	✗	✗	✓	✗	13
3	✓	✓	✗	✗	✓	✗	✓	✗	✓	✓	✗	14
4	✗	✓	✓	✗	✗	✓	✗	✗	✗	✓	✗	15
5	✗	✓	✗	✗	✓	✗	✓	✗	✓	✓	✗	16
6	✗	✗	✓	✓	✓	✗	✗	✗	✓	✓	✗	17
7	✓	✗	✓	✓	✗	✓	✓	✗	✓	✓	✗	18
8	✗	✗	✓	✗	✗	✓	✗	✗	✗	✓	✗	19
9	✗	✗	✓	✓	✗	✗	✗	✗	✗	✓	✗	20
10	✗	✓	✓	✓	✗	✓	✗	✗	✓	✓	✗	21
12	✗	✗	✗	✗	✗	✗	✗	✓	✓	✗	✗	22

In the table 2 comparative analysis of various existing parameters have done with the proposed parameters used in this study. The existing parameters show the type of parameters used in the education sector. The proposed parameters used in this review are Student's mental health, teaching effectiveness, and framework capabilities.

In section 2 role of machine learning in the existing frameworks has been discussed. Machine learning is used in automatic attendance to the prediction of the early dropping of students in the education sector. Various machine learning
models are discussed in this section. Section 3 includes the methodology. Section 4 includes real-time data analyses by measuring various framework capabilities. Section 4 is about data analysis in education based on the existing educational frameworks. Section 5 incorporates challenges and future scope. Section 6 is a about recommendations of the review and section 7 is a summary and section 8 is a conclusion.

2 .Role of machine learning in existing educational frameworks realized by other researchers

In this paper authors [23] have proposed a framework designed by the Indonesian community and governments which uses Blockchain technology to improve the Tertiary Education System. This platform was developed using artificial intelligence. So, the framework is suited to Indonesian tertiary education as it was using the Blockchain technology framework along with artificial intelligence. By using blockchain technology in the education system time wasted on verification and validation of certificates is saved.
In STEM education authors [24] [25] have used a paradigm that compares and improves early prediction. The use of a hybrid technique that combined the classifier with an ensemble four-class classifier improved performance. The hybrid technique produces the greatest outcomes with few features while also providing the highest overall accuracy. Four times a semester's worth of forecasts are accomplished. Machine learning methods used for prediction include Logistic Regression, KNN, Multi-Layer Perceptron, Random Forest Classifier, Gradient Boosting Classifier, and Adaptive Boosting Classifier. Machine learning can assist in the improvement of student performance.
In this study author [26] had used a framework to identify the learning style of artificial neural networks and it was based on a portfolio designed by balance game with Felder Silverman's learning style. This game was used to collect learning portfolios and students' physical balance knowledge. Learning style in STEM Education uses portfolio data for the input of the Support Vector Machine which is used for the identification of students' learning styles. Problem-solving, learning motivation, and learning outcomes were anticipated by the learning
style of the student.
This author [27] had focused on MOOC. It provided a very good opportunity to the learners

with minimal or no changes who can't get this from premier institutions. Quality of education can be disseminated with this alternative. Various aspects like dropout rate, Attention, student interest, and engagement were major challenges in MOOCs. A dropout prediction model with the help of machine learning algorithms had been developed.
In this paper authors [28] came across various benefits of the learning management system, although this method still faces many challenges. Problems mentioned in this paper are quiz-making capabilities and language etc. Through this study, it was conveyed that productivity and information learning of the LMS users can be increased with the help of web technology and learning technologies.
In this paper author [29] had done prediction learning of outcomes on short-term online courses. This behavior of the learner is also captured as content when learners interact with each other and course content. The methodology used has behavior-based machine learning features only. Behavioral analytics about the instructor can also be generated by the same method. To enhance
the future performance of other content and student learning networks can be classified further.
In this paper author [30] has been surveyed to check the student's perception of the teaching-research connection. After attending the lectures student's perceptions about the lectures have been recorded on five Lickert scales. It was revealed in the paper that teaching research was an effective student learning method, especially for postgraduate students.
In this paper authors [31] have proposed that the learning engagement of students has been improved by doing early prediction of students. Students at risk have been informed timely. This model has very good generalization ability. The first warning list is prepared on the bases of performance prediction then students at risk have mentioned it.
In this paper authors [32] have found that it is necessary to impart knowledge to the student at the school level about mental health so that they can solve their problems and fulfill their social requirements. In this paper, a Model promoting the mental health of middle school students was established. In the 21st-century ability of students coordinate and good communicate has been going to matter which will come from good mental health. Physical education can develop good habits and correct decisions about health and help in reducing stress, depression, etc.
The authors of this article [33] intend to determine if a clinical placement's educational context affects undergraduate students' mental health. Students who participated in an Autonomy program experienced a noteworthy reduction in stigma from pre to post-placement.
This paper [34] has considered the concept of the mental health field and student anxiety about work. It may be reduced with the help of simulation. Examination scores of the students correlate with anxiety. A decrease in anxiety may result in an improved examination score. The authors of this article intend to determine if a clinical placement's educational context has an impact on undergraduate students' mental health stigma. Students may feel more at ease with mental health care if they participate in simulations.
In this paper authors [35] have mentioned various factors that triggered mental the health of engineering students like stress, interpersonal conflicts, academic stress, etc. The main focus here is to identify challenges, and strategies to overcome and navigate these challenges and what types of structures have been used. Here experiences of the engineers about their mental health have been shared and finally, work regarding eliminating the stigma of many students can be done by the engineering education research community.
In this paper author [36] has discussed various teaching methods and compared a lecture, case studies, and simulations. Students' perceptions of these methods have been assessed. Assessment on problems of students like skill, interpersonal skill, and self-awareness has been assessed. Students of the business studies found simulation as the most effective method of teaching. Students' problem-solving skills have been developed more in simulation and case

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studies as compared to the lecture.
In this paper authors [37] have developed a framework that can help higher education institutes with the assessment of teaching effectiveness. Pilot testing has been done at various stages of the assessment framework. Pedagogical approaches changes have an effect on the learning process as well as on the teaching effectiveness.
In this paper author [38] has shown a relationship between emotional intelligence and clinical teaching effectiveness. The results of this paper help inconsiderate the role of teaching effectiveness and emotional intelligence but there was no statistical correlation between these two parameters.
In this paper authors [39] have discussed that assessment of student learning is a very important part of teaching. But it should be done well on time. In this paper, the author has been discussed different feedback techniques to get students' feedback about different teaching settings. Here for feedback classification scheme has been used. Student feedback is a valuable way of improving teaching effectiveness. Two criteria are highly relevant i.e. time required to apply feedback and efforts to evaluate feedback.
In this paper authors [40] have used the feedback of students to measure the teaching effectiveness. While teaching effectiveness was measured then scores of feedback were used in a way that gave minimum variance with unbiased results and a mathematical model represented it.
In this paper authors [41] have given that in many previous pieces of research, reviews of the teachers have been seen but in this model, teaching effectiveness has been reviewed. Teaching effectiveness is affected by character sticks like teacher education and teacher knowledge. For the extended model, the core is the micro-level teaching model.
In this paper authors [42] had discussed that teaching effectiveness made a difference in mental health education courses. To improve teaching effectiveness, information technology has played a great role in the resources like MOOCs and Flipped Classroom. With the use of technologies like artificial intelligence, automation, and an internet app Wechat instant messaging, feedback, and exchange service are convenient mental health services provided to university students.
In this paper authors [43] have explored various measures of teaching quality. Here teaching quality's core aspects in the context of student achievement have been assessed and understood. Classroom assessment scoring framework for teaching etc. has been considered for measuring teaching effectiveness. Students need teachers' warmth, rigor, and support for a positive learning environment.
In this study author [44] has given behavioral factors identified to increase the understanding of mental health issues. Five factors like Excessive drinking, obesity, physical inactivity, smoking, and frequent mental distress have been identified. Unsupervised data mining techniques like association analysis and clustering algorithms had been used to measure the strength of occurrence between the transactions. In the case of females, the accuracy of the association rule was found with 100 % accuracy. The findings of the paper help the authorities in policy making so that mental health issues can be handled in a better way.
In this paper author [45] has proposed a framework. A checklist was developed to increase the empathy and valuation and training of psychomotor performance. Virtual reality surgical simulation and machine learning algorithms were used during the analysis of the study. This checklist will ensure quality to assess surgical expertise and help the researchers in medicine, computer science, and education.
In this paper authors [46] have prepared a structure to analyze the per- performance of the students based on their previous performance. The motive of this structure is to improve the marks of the students who are not performing well using data mining under classification. It is

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derived from the study that a student's performance is affected by many factors like academic information, family details, personal information, etc.
In this study authors [47] have offered services to increase the quality of an integrated framework EDUC8 was purposed. This framework is a complete tool that coverers the technical as well as the financial dimensions of a learning pathway. To see students' potential in terms of character sticks, educational factors, and outcomes unsupervised learning technique i.e. data clustering was used.
In this paper authors [48] have done an experiment evaluation for recognition of human activities in technological education on data collected from smart sensors using a supervised technique of machine learning. KNN and decision tree have given the batter accuracy as compared to Bayesian and SVM.

3 . Methodology

In the process of student learning, machine learning is playing a dominant role. To develop a machine learning model first step used was to collect data. Data collected can be unstructured and noisy so preprocessing of the data desired to be done. Accurate results can be derived with clean data only. Further classification of the data needs to be done. Feature selection is the next important step to creating a machine learning model. Relevant features were extracted by using feature engineering. Then best machine learning algorithm is selected as per the problem and dataset. Data can be supervised or unsupervised. In the case of labeled and continuous data, regression algorithms can be applied. Commonly used regression algorithms are random forest regression, multiple linear regression, linear regression, SVM, etc. In the case of labeled and discrete data classification algorithms were applied like KNN, naïve-Bayes, random forest classification, and decision tree classification. Classification and regression algorithms come under supervised learning. Unlabeled data can be classified into clustering and association. Training and testing are the next important step. The first training of the desired model is done and after that testing is done on unseen data. Accuracy, precision, and recall are the parameters that help in checking the performance of the model. The final step is to do prediction or draw inferences.
Figure 2 shows the general development process of the model. Steps followed from data preparation to model delivery followed in a sequence.

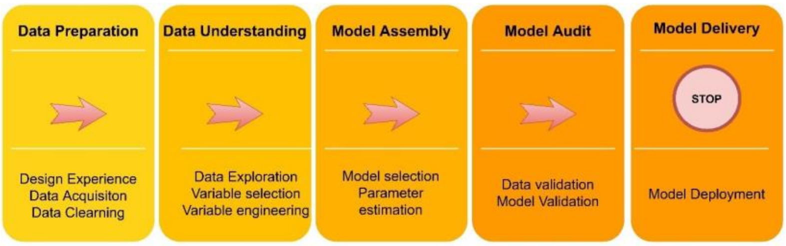

Fig. 2 Methodology of the model development process

1. Data Preparation: Data is a primary element in the creation of a machine learning model. The quality and quantity of information have a direct impact on the working of the machine learning model. Datasets can be created from scratch or existing datasets can be used. Correlation among the parameters can be seen at this stage by visualizing the data. Data cleaning is performed at this stage by removing null, missing, and unwanted values.
2. Data Understand: Data understanding includes exploration of the data. Once a dataset

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is finalized next step is to see the type of parameter. Parameters are used in the training process. The algorithm used identifies the mapping between input features and the label. Feature selection is also done at this stage.

3. Model Assembly: Depending upon the type of the data and objectives model assembly is done. Several algorithms come under supervised and unsupervised learning. Algorithms of classification, prediction, linear regression, clustering, i.e. k-means or K-Nearest Neighbor, Deep Learning, i.e., Neural Networks, Bayesian, etc. can be used to prepare a model.
4. Model Audit: Model audit includes data validation and model validation. Data validation checks the authenticity of the data. Data sources should be valid. So that correct data be pushed on the model. Once correct data is pushed to the model it will give the correct output. Model validation means checking the correctness of the test data. Dataset is divided into training and test dataset. The accuracy of the test dataset is measured using values of the recall, precision, mean square error, etc. functions.
5. Model Delivery: Once a model audit is found satisfactory then the model can be deployed. This is the final step of the model development process.

4 Real-Time Data Analysis in Education using Machine learning

After identifying the various educational frameworks, it has been recognized that various teaching frameworks have diverse effects on the students.
In figure 3 years wise objectives, parameters, and techniques have been seen. It has been seen that machine learning was used throughout the years from 2017 to 2021.

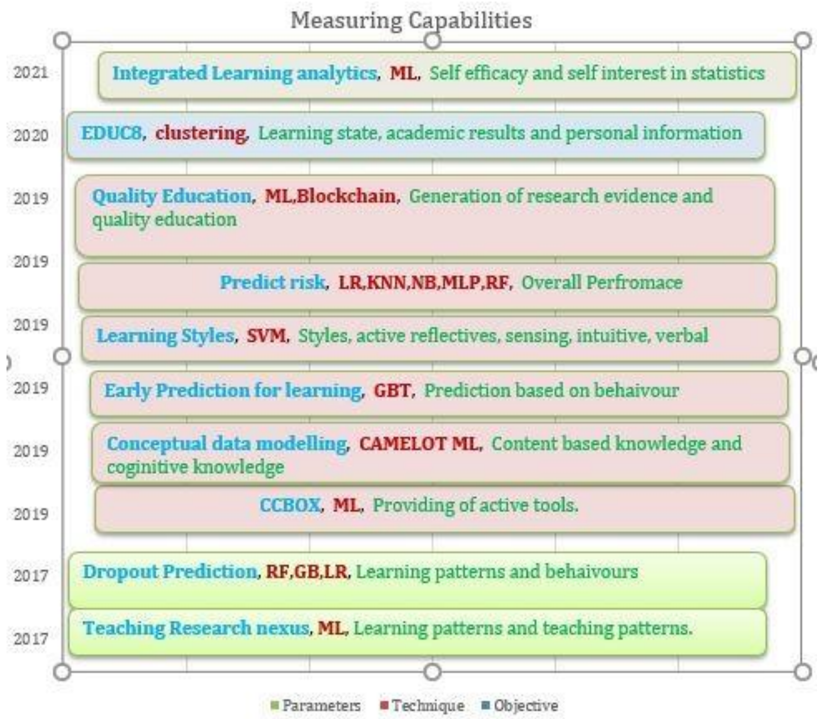

Fig. 3 Measuring the frameworks' capability concerning objective, parameter, technique, and year.

The basic idea in table 3 is to see how these teaching frameworks predict the status of the students during the semester, their dropout status, learning style, etc. The main motive is to improve the education quality and machine learning techniques like logistic regression,

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classification, etc have been used for it.

Table 3. Measuring the frameworks' capability

Author name	Year	Objective	Technique	Parameters	Claims	Research gap	Reference
J. Y. Wu et. al,	2021	Developing an integrated learning analytics framework	Machine Learning	Self-efficacy, interest in statistics	During the pandemic, this study gave promising results.	Examined learners' demographic backgrounds, motivational measures	[49]
O. Iatrellis et. al.,	2020	Integrated framework EDUC8 was purposed	Clustering	Learning state, academic results, and personal information	optimizing educational services and minimization of costs for tertiary institutions	Covers both technical and financial parameters	[47]
U. Rahardja et. al.	2019	Nationwide improvement in quality of education	Blockchain and machine learning	To generate research evidence, conducted qualitative research, literature review, case studies, and desk research were used.	A combination of Blockchain and machine learning suited the best.	The consistency of the models, context, variables', indicators, and platform relationships still need to be clarified in the future.	[23]
M. Hasan et. al.	2019	During the semester, predictions were made on students who were at-risk, prone to risk, all right, and good.	Multi-Layer Perceptron, Random Forest Classifier, Logistic Regression, KNN, Gaussian Naive Bayes and gradient boosting Classifier,	Three class classifiers for prediction.	The hybrid approach outperforms.	For each group, this hybrid approach would demand unique methods for calculating recall and precision.	[24]

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			Multi-Layer Perceptron				
C. H. Wu et. al.	2019	Identification of students' learning styles based on the learning portfolio data.	support vector machine (SVM)	Learning styles: active-reflective, sensing-intuitive, visual-verbal and sequential global.	Different learning style adopted by the students makes difference in learning motivation, emotion, and outcomes.	Learning process of different types of games, new learning styles can be recognized in future research.	[26]
R. N. Laveti et. al.	2017	Dropout prediction model	Random Forest, Gradient Boost, and Logistic Regression.	learning patterns and the behavior	To acquire a better knowledge of the learning patterns and behavior of online learners, statistical analysis was done, and subsequently, drop-out prediction models were built.	Accuracy can be achieved for both small and large data sets after the system has been fine-tuned. Temporal models can be used to improve the accuracy of the predictions even more.	[27]
H. Wan et. al.	2019	Early prediction for improvement in learning engagement.	Gradient boosting decision tree (GBDT)	BEHAVIOR-BASED PERFORMANCE PREDICTION	The generalization of the prediction model is high across the teaching iteration.	The learning model can be improved by Extending LMS functions and auto-grading.	[31]

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S. A. Trivedi	2019	Evaluate CCBOX activity	Machine learning techniques	CCBOX active teaching-learning tool.	By using the CCBOX method and machine learning techniques advanced students' performance Prediction can be done.	Unsupervised machine learning clustering can be done.	[50]
F. Ahammed et al.,	2018	Teaching research nexus	--	Research-driven teaching	students' perception of the teaching-research connection	This can be used in the curriculum development of postgraduate students.	[30]
D. Bogdanova and M. Snoeck	2019	The framework proposed for conceptual data modeling.	Developed CaMeLOT framework as a revised Bloom's taxonomy adapted	Content area, Knowledge level, Cognitive level.	Improved Quality and reduce time in designing educational material.	Continuous evaluation of learning material.	[51]

In table 3 various machine learning and other techniques, parameters, claims, and research gaps have been discussed. Different educational framework affects the students in various ways. Student behavior has given importance to understanding the student's mental health. Students who fall into mental health difficulties have faced problems like beliefs and attitudes in college, symptoms of mental illness, fear of confession, knowledge of this illness, etc. [52]. Students need to feel strengthened to improve their mental health. Students feel great stress even the mental health nurses and the reason found was that newly came nurses have different medication interpretations and need more practical education [53].

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Fig 4. Parameters of Mental health. Figure 4 shows techniques, parameters, year, and author name. Various machine learning algorithms are used to handle and identify the student's mental health. Parameters like anxiety, depression, and academic distress have been discussed.

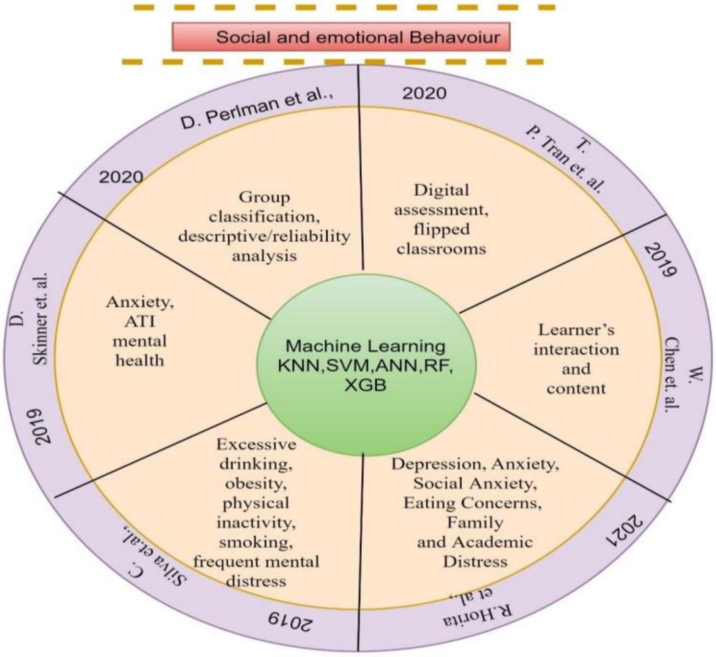

Fig. 4 Parameters of Mental health

Basic elements found for mental health are stress, anxiety, and depression [54]. One important point came across when the nursing students of two institutions India and Australia were compared on the parameters of stigma and the therapeutic relationship. It was found that Indian students indicated a higher level of stigma and therapeutic relationships may be due to cultural differences and perspectives regarding mental illness. Collaboration of institutions on the international level may help in reducing cultural differences [55]. In general, the population is not more prone to suffering from mental health rather students from the college are found more prone to it [56].

Table4. Evaluating students' mental health

Author name	Year	Objective	Technique	Parameters	Claims	Research gap	Reference
T. P. Tran et. al.	2020	New use of web technologies and learning analytics	Machine learning.	Digital assessment flipped classrooms	Improvement in LMS user productivity, supporting, and informing	Analyzing and designing tools to enhance modern learning modalities based on the rich learning data	[28]

					learning	acquired by the systems.	
W. Chen et. al.	2019	Predicting learning outcomes via learning behaviors	KNN, SVM, LDA, RF, ANN and XGB.	Learner's interaction and content.	Obtained high prediction quality. SLN attributes became a more useful set of behavior for prediction over time.	The focus is on the short-term courses with single output instead of semester-long courses.	[29]
D. Perlman et. al.	2020	Examine whether a clinical placement's educational context influences undergraduate students' mental health stigma.	Learning Climate Questionnaire and the Social Distance Scale	Group classifications, descriptive/reliability analysis, clinical placement fidelity, and research question examination.	Nursing students' mental health stigma can be influenced by clinical place ment.	The survey was a self-reporting tool. There was a statistically insignificant difference in LCQ and SDS scores before and after clinical placement.	[33]
D. Skinner et. al.	2019	Students' perceptions of mental	Independent T-test, regression	Anxiety, ATI mental health. Dataset	A significant relationship	The impact of simulation on learning	[34]

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		health are influenced by simulation exposure.		for the study was collected from Midwestern university.	between anxiety and ATI mental health exam and safety.	outcomes and trends in nursing graduates' work choices in diverse care sectors will be investigated in future studies.	
C. Silva et.al.,	2019	Identification of behavioral factors to improve the understanding of mental health issues.	Data mining, association rule, clustering	Excessive drinking, obesity, physical inactivity, smoking, frequent mental distress	Findings help the authorities to make decisions about policy making.	Improve the mental health of the citizens.	[44]
R.Horita et al.,	2021	Comparison of students' mental health in the current and previous year	Survey, T-test	Depression, Generalized Anxiety, Social Anxiety, Eating Concerns, Hostility, Family Distress, Academic Distress	The low-risk rate among the students during COVID.	Compare student mental health during COVID 19 and before that.	[57]

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X.Zhang et al.,	2010	Establishment of the mental health education system	Visual C# and ADO.NET	Education of mental health, Psychological testing and evaluation, Psychological consultation, System management	Increase decision-making for leadership, and efficiency in mental health education.	Provide support for mental health education of university students and improve work efficiency	[58]

In table 4 various parameters affecting students' mental health have been discussed. Claims and research gaps have been discussed too.
Now the scenario has been changed, 3-9 years children are observing, familiarizing, and producing machine learning datasets and models [59]. While comparing machine learning processes with the human mind we know that the human mind is influenced by many factors like environment, interests, hobbies, etc. whereas machine learning has high efficiency, effects, and easy preservation of learning results. So, the complex and complicated work done by machine learning will help human beings. In this era to promote AI and traditional education collision between machine learning and traditional learning will also be a new attempt [60]. It is derived from the study that a student's performance is affected by many factors like academic information, family details, personal information, etc. Teaching effectiveness is also playing a very important role in student learning.

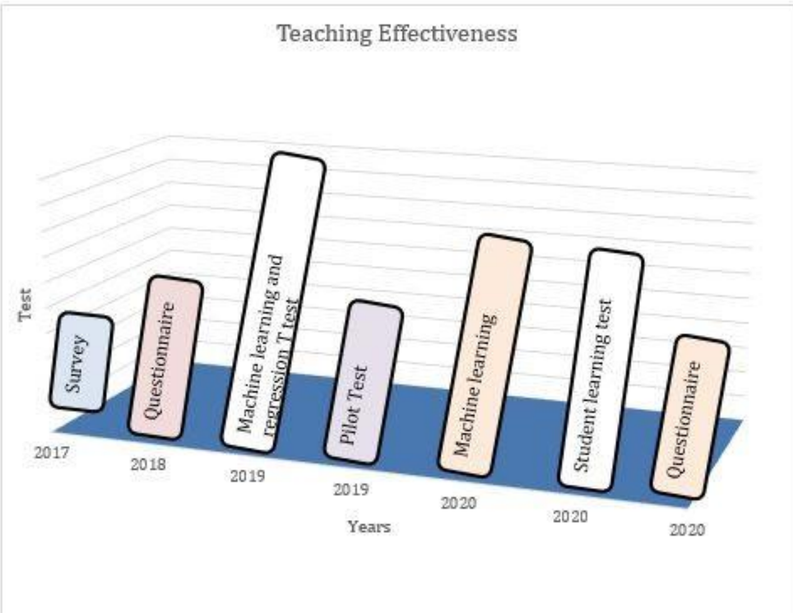

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Fig. 5 Teaching Effectiveness concerning year, parameters based on tests and techniques.

Fig 5. Teaching Effectiveness concerning year, parameters based on tests and techniques. Figure 5 shows various parameters based on the tests and techniques. In the year 2017 survey was conducted where self-assessed comfort level designates improvement in learning. The year 2020 has shown improvements in teaching effectiveness with the improvement in teaching style.

Assessment in education measures how many learning outcomes have been achieved. Machine learning and crowdsourcing were used for the assessment. But hybrid assessment approach which includes both machine learning and crowdsourcing was never applied together. To improve the student's performance students learning needs to be improved by merging both machine learning and crowdsourcing which will enhance education in terms of accuracy and efficiency [61].

Table 5. Identifying the effectiveness of teaching

Author name	Year	Objective	Technique	Parameters	Claims	Research gap	Reference
M. Farashahi et. al.	2018	Comparison of various teaching methods	survey questionnaire	Learning outcomes, a control variable	In students' perception Simulation is the utmost effective teaching method.	Students' perceptions for the assessment of teaching effectiveness variables like problem-solving and interpersonal skills and awareness have not been controlled.	[36]

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C. V. Miguel et. al.	2019	Created a framework for evaluating the efficacy of different pedagogical methodologies.	Pilot testing	The course's strategic nature, relevance of the proposed formation, pedagogy and pedagogy approach, and so on.	This framework assesses the efficacy of various pedagogies in course delivery.	The framework was piloted after students had been assessed, rather than during the course delivery.	[37]
C. K. Mosca et. al.	2019	Examine the link between emotional intelligence and clinical teaching effectiveness.	Multiple regression and T-test	To assess emotional intelligence, the Schutte Self-Report Emotional Intelligence Test (SSREIT) was used.	Understanding emotional intelligence has improved clinical teaching effectiveness.	No link between emotional intelligence and the effectiveness of clinical teaching. However, there is a strong link between faculty rank and clinical teaching effectiveness.	[38]

J. Scheerens et. al.	2016	Teacher education effectiveness	--	Teacher knowledge, pedagogical knowledge, and insight into student learning.	Educational effectiveness is reviewed.	Model Developed considered formal education.	[41]
M. Z. Husain et al.,	2015	Improve teaching effectiveness in physical education.	--	education knowledge, subject content knowledge, variety of skills in communicating their subject matter and attitude	In physical education Teachers and administrators should take action to measure and solve the problems.	Students have a high interest in physical education subjects.	[62]
K. J. Dickinson et al.,	2020	Earning preferences and teaching styles affect surgical educator effectiveness.	Multimodal learning	Learning preferences, Learning style, teaching effectiveness	Teaching style affects the effectiveness of educators.	Teaching style self-assessment by attending could improve the effectiveness	[63]

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N. Kushik et al.,	2020	Based on teaching efficiency, prediction of student's proficiency.	Machine learning	Good tongue, a good ear, homework.	Scalable prediction of the effectiveness of a teaching strategy.	Educational methodology, application of the formal model, and proficiency of students need to be understood to evaluate the educational effectiveness process.	[64]
G. A. Boysen	2020	Comment on the parameters selected by the students for teaching effectiveness.	Questionnaire	How much the students enjoyed the class, how much they learned, and how effective the instructor was at teaching.	In this study, the outcome measures simply did not assess effective pedagogy.	Use of scientifically sound pedagogy is required.	[65]
P. Oelschlaeger	2017	Assessment of teaching	Survey	Changes in student comfort with the	The self-assessed comfor	Compare and contrast perfor	[61]

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		effectiveness and learning outcomes.		topics presented, as judged by the students themselves.	t level (SACL) indicates that learning improves over time.	mance with traditional student assessments of instruction (SET)	
S. K. Carpenter	2020	Review on the learning illusions of students.	--	Enthusiasm, preparation, and knowledge	The approaches used gave biased ratings.	Rethink measures to evaluate teaching effectiveness.	[66]

In Table 5 One more important parameter of education, teaching effectiveness has been discussed. The students found the simulation method of teaching to be the most effective. Emotional intelligence also plays a substantial role in the effectiveness of teaching. Here, the outcome measures simply did not assess effective pedagogy.

Challenges and future work

In the future Blockchain technology can better address the development factor in education. Though blockchain provides features like Self- sovereignty, trust, transparency, Disintermediation, and immutability. All of these features aided education greatly, but technology is still in its infancy, and recent advancements will have a significant impact in the future. Alternative case studies that better address the contribution of Blockchain technology development in education are possible [23].

One major problem faced in the prediction is that most students' performance prediction has been done 4 times in a semester. This prediction is done by using classification in machine learning. But students' predictions should be done on daily bases by using machine learning. Moreover, we can perform it by using real-time which will give a more accurate and real-time prediction of the student performance [24].

In the past, questionnaires were used to determine the role of learning style, but in the future, researchers can develop learning styles by recognizing systems through various forms of games, the game’s learning process, and various deep learning algorithms. Students’ learning motivation, problem-solving skills, and learning outcomes all differ significantly depending on their learning style [25].

A framework based on cutting-edge Learning Analytics Workflow has been put in place for MOOCs. To better understand the learning patterns and behavior of online learners, a rigorous statistical study was conducted. An ensemble technique was utilized to determine the dropout prediction. For improved accuracy, a smaller or extremely big data collection can be utilized in the future to detect dropout prediction. To increase the accuracy of our forecasts, we want

to apply temporal models [26].
Piloting in the assessment of teaching effectiveness of higher education is done after students have been assessed. But for a real assessment of teaching effectiveness, can be done during the delivery of the course. So, in the future, a framework can be developed which includes assessment during the delivery of the Course [37].
Education institutions should incorporate new technologies into their teaching activities and be disaster-ready at all times [10].

Recommendation

In higher education, the building of digital teaching resources may be done with the use of blockchain technology. The construction of a network benefits both teachers and students in the sharing of knowledge. Information resource sharing activities and information service institutions will undergo significant changes as a result of blockchain and new energy. [67].
The immutability of records and certifications, as well as security and independence from the institution, are all addressed by a decentralized student information system. Blockchain programming will make data storage and sharing much easier [68]. To assess student learning outcomes, machine learning techniques such as Decision Tree, SVM, Random Forest, and Naive Bayes can be employed. Machine learning algorithms may be used to determine whether learning objectives have been met or not [25, 69]. Micro-level academic achievement can be measured and achieved using machine learning. In the proposed review it is recommended that the assessment of the students should be assessed on a real-time basis. Lecture wise assessment of the students will propose an actual achievement of the students. Assessment of the students after the completion of a semester can be changed with any time assessment of the students. Students' mental health and emotions are playing a prominent role in the development and achievement of the students. This can be easily achieved with the help of machine learning. Students' assessment after a few weeks of starting a particular course and timely prediction about the performance can help the students to improve their performance.

Summary of the Proposed Research work

In this review, various parameters affecting student learning have been discussed. It has been seen that machine learning is widely used in the education sector. Predictive analysis in education helps both teachers and parents to know about things that might happen in the future. The first warning list of the students can be prepared based on the performance prediction. Prediction can be made based on the previous performance. Early dropout of the students can be predicted using machine learning [69]. Certificates verification and validation can also help in the education sector. In the coming time, machine learning will revolutionize the education sector. Existing educational frameworks indicated that the change in technology over some time has a positive effect on the students learning outcomes. But at the same time, it has been observed that students are suffering from stress, anxiety, anger, etc. A segment of society that is mostly affected by the aforementioned parameters is students. Teachers' behavior, way of teaching, teaching style, etc. can make improved in them. So, teaching effectiveness has a great impact on the students. Behavior analytics for the teacher can be prepared based on the machine learning models. Frameworks are developed in a Higher education institution for assessing the teaching effectiveness. Feedback can be used to measure teaching effectiveness. Various teaching methods like a lecture, case studies, simulations, and group learning can be used to improve student learning. Students need warmth and a positive environment for better learning outcomes.

Conclusion

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Machine learning is playing an important role in the field of education. This paper's initial focus was on the various learning approaches and the role of machine learning in education. The use of machine learning, IoT, and blockchain in education enhances student learning outcomes and teaching effectiveness. It was also observed that during COVID 19 various new technologies were applied to overcome the problems faced in the education sector. ML is used to mark automatic attendance and predict students' marks, attendance, and academic emotions in class. Even real-time assessment and early time dropout amongst the students can be identified. The main motive to review various teaching frameworks is to advance the quality of education. After going through and analyzing various educational frameworks it has been observed that there are many factors affecting the students during a class. In this review, the main focus is on the three parameters like the mental health of students, the usefulness of the framework designed, and teaching effectiveness. Stress, anxiety, depression, etc. are the main elements that affect students' mental health and it has been found that college students face the problem of mental health more as compared to the general population. Teaching effectiveness also has a great impact on the students. Learning outcomes of the students depends upon the various parameters of teaching effectiveness e.g. teaching style, way of talking, listening ability, enjoyment during learning, student comfort, etc. In the end, based on these parameters various problems still exist in this domain discussed. Moreover, Research problems to address these problems are also mentioned which can help in future research.

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